

REMARKS

In further support of the amendment presented, Applicant submits the following remarks.

I. Prosecution History and Current Status of Claims

Claims 1-44 were originally presented for examination. In the first Office Action Claims 1-44 were provisionally rejected under the judicially created doctrine of double patenting over claims in Application Nos. 10/026,044, 10/026,055, and 10/026,016. Claim 1-44 stood rejected under 35 U.S.C. § 112, second paragraph for being indefinite. Claims 1 stood rejected under 35 U.S.C. § 102 as being anticipated by Eglash et al (5,251,255). Claims 2 and 7-10 stood rejected under 35 U.S.C. § 103(a) as being unpatentable over Eglash et al (5,251,255) in view of Spruytte et al (US2002/0075920). Claims 5-6 stood rejected under 35 U.S.C. § 103(a) as being unpatentable over Eglash et al (5,251,255) in view of Arakawa et al (5,757,833). Claims 3-4, 11-14, 29-30, 33-38 and 41-44 stood rejected under 35 U.S.C. § 103(a) as being unpatentable over Eglash et al (5,251,255) in view of Jewell et al. (6,359,920). Finally, claims 15-28, 31-32 and 39-40 stood rejected under 35 U.S.C. § 103(a) as being unpatentable over Eglash et al (5,251,255) in view Jewell et al. (6,359,920) and further in view of Spruytte et al (US2002/0075920). In response to the first Office Action, Applicant cancelled claim 29-44, and added claims 45- 59.

In the current Office Action, made Final, Claim 1-28 and 45-59 stand rejected under 35 US.C. §112, second paragraph as being indefinite for failing to particularly point out and distinctly claim the subject matter Applicant regards as his invention. Claim 1-28 and 45-59 again stand provisionally rejected under the double patenting doctrine over claims in Application Nos. 10/026,044; 10/026,055; and 10/026,016. Also, claims 1-28 and 45-59 stand rejected under 35 U.S.C. §102(a) as being anticipated by Jewell et al. In response to the Final Office Action, Applicant has amended claims 1, 45 and 53. Claims 1-28 and 45-59 continue to remain pending in the present application. Applicant now respectfully requests reexamination of his application for patent.

II. Objections Under 35 U.S.C. § 112

Claims 1-28 and 45-59 stand rejected under 35 U.S.C. §112, second paragraph, as begin vague and indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the inventions. Claims 1, 45 and 53 were cited specifically for claiming a quantum well having a well depth of at least 40 meV.

Applicant has amended Claims 1, 45, 53 in a manner that should now clarify for those skilled in the art how and why a quantum well's depth is determined in terms of mili-electron-volts (meV) in accordance with the teachings of the present invention. In pages 21-22 of the specification, Applicant describes that the performance of quantum wells associated with semiconductor lasers depends on many factors including quantum well depth. A quantum well's depth is determined after the valance and conduction band values are established. A quantum well's depth is where the recombination of holes with electrons occurs; therefore, the larger a quantum well's depth, generally a better environment for luminescence and gain is provided for the associated semiconductor lasing device. A quantum well's depth is a virtual area defined by the range between the setpoints, or offsets, for the valance and conduction bands, which can be controlled or adjusted.

Applicant describes the control over valance and conduction band offsets for providing quantum wells having depths of at least 40 meV. Applicant has determined how to establish and control offsets, and quantum well depths as a result, by using certain materials. It is now clearly set forth in Claims 1, 45 and 53 that valance and conduction bands offsets establish well depths of at least 40 meV. The claims also provide for the use of unique materials (i.e., InGaAsSb quantum wells, AlGaAs barrier layers, GaAsN confinement layers including at least one of N, P and Al). Discussions of how to achieve band offsets and establishing quantum well depths by Applicant is not interchangeable with general observations and discussions made in the art of band gap efficiencies and quantum well

thickness. The difference should be well understood by those skilled in the art after reading Applicants description.

Applicant has amended claims 1, 45 and 53 to provide “a vertical cavity surface emitting laser, comprising: an active region further comprising at least one quantum well having a depth of at least 40 meV, wherein said depth is defined as the difference between a valence band offset and a conduction band offset . . .” When referring to Applicant’s discussion of “band offset,” one skilled in the art should be able to realize that it is now possible to achieve optimum confinement of carriers within quantum wells for semiconductor lasing devices where the quantum well(s) comprises well depth of at least 40 meV.

The depth of quantum wells as described and taught by applicant can be measured and established using meV and the unit of measurement. Quantum well depth as taught by Applicant is not physically measured in the same manner as that of a quantum well’s thickness (Applicant also teaches that the quantum wells can be about 50 Angstroms thick). The graphs provided by Applicant in Figs. 17 and 20 provide a horizontal scale for the measurement of the thickness of layers for a device in unit of “microns.” The vertical scale of the same graphs provide for the measurement of output associated with devices in units of “electron volts.” Applicant uses Figs. 17 and 20 to teach those skilled in the art that quantum wells having a depth of at least 40 meV are based on the difference in setpoints for the valance and conductions bands. A 40 meV quantum well depth provides an output that is considered acceptable. Larger depths provide even more desirable results, as described in the specification, therefore 40 meV is the minimal depth desired in accordance with the teachings by Applicant.

There should not be any confusion in the art how to go about establishing quantum well depths electronically based on Applicants description. The manner of determining quantum well depths is very simply explained in pages 21 through 22, and Figs. 17 and 22, of the application. Quantum well “depth” is a term understood by those skilled in the semiconductor laser art. Quantum well depth should not be confused with quantum well thickness which can

be measured physically. For the foregoing reasons, Applicant respectfully traverses the rejection of his claims under 35 U.S.C. §112, paragraph 2, as being indefinite.

III. Provisional rejection under “double patenting” doctrine.

Claims 1-44 stand provisionally rejected under the judicially created doctrine of double patenting over claims 1-59 of co-pending Application number 10/026,044, claims 1-6 of co-pending Application No. 10/026,055, and claims 1-34 of co-pending Application No. 10/026,016. Applicant again respectfully traverses the provisional rejection.

According to 37 CFR 1.141, two or more "independent and distinct inventions" may not be claimed in one application. Applicants, being aware of this requirement properly filed five patent applications on the same date for inventions that are admittedly related, but are patently distinct as claimed.

According to Section 801 of the MPEP, “[t]he law has long been established that dependent inventions (frequently termed related inventions) such as used for illustration above may be properly divided if they are, in fact, ‘distinct’ inventions, even though dependent.” Furthermore, according to Section 801, “[t]he term ‘distinct’ means that two or more subjects as disclosed are related, . . .but are capable of separate manufacture, use, or sale as claimed, AND ARE PATENTABLE (novel and unobvious) OVER EACH OTHER . . .”

According to Section 803 of the MPEP, “[s]ince the doctrine of double patenting seeks to avoid unjustly extending patent rights at the expense of the public, the focus of any double patenting analysis necessarily is on the claims in the multiple patents or patent applications involved in the analysis.” (Emphasis added.)

According to examiner guidance provided in the MPEP, Section 801(A):

In determining whether a statutory basis for a double patenting rejection exists, the question to be asked is: Is the same invention being claimed twice? 35 U.S. C. 101 prevents two patents from issuing on the same invention. "Same invention" means identical subject matter. *Miller v. Eagle Mfg. Co.*, 151 U.S. 186 (1984); *In re Vogel*, 422 F.2d 438, 164 USPQ 619 (CCPA 1970); and *In re Ockert*, 245 F.2d 467, 114 USPQ 330 (CCPA 1957).

A reliable test for double patenting under 35 U.S. C. 101 is whether a claim in the application could be literally infringed without literally infringing a corresponding claim in the patent. *In re Vogel*, 422 F.2d 438, 164 USPQ 619 (CCPA 1970). Is there an embodiment of the invention that falls within the scope of one claim, but not the other? If there is such an embodiment, then identical subject matter is not defined by both claims and statutory double patenting would not exist. For example, the invention defined by a claim reciting a compound having a "halogen" substituent is not identical to or substantively the same as a claim reciting the same compound except having a "chlorine" substituent in place of the halogen because "halogen" is broader than "chlorine." On the other hand, claims may be differently worded and still define the same invention. Thus, a claim reciting a widget having a length of "36 inches" defines the same invention as a claim reciting the same widget having a length of "3 feet."

If it is determined that the same invention is being claimed twice, 35 U.S. C. 101 precludes the grant of the second patent regardless of the presence or absence of a terminal disclaimer. *Id.*

The claims for each co-pending applications are directed to distinct inventions. All of the elements for the independent claims of the present application are not fully and identically contained in any of the co-pending applications identified by Examiner. Furthermore, each invention claimed in the co-pending applications is unique because the elements contained therein are different and any semiconductor product based thereon can be produced and sold independently.

First, the present invention, as presented in independent claims 1, 45 and 53 claims a VCSEL with "*InGaAsSb*" in its quantum well and having a well depth of at least 40 meV. Application number 10/026,044 independently claims "*Indium free*" VCSELs including "*GaAsSb*" in its quantum well and having a well depth of at least 40 meV. Application No. 10/026,055 independently claims "*InGaAs*" in quantum wells that have a well depth of at least 40 meV. Application No. 10/026,016 independently claims "*InGaAsSbN*" in quantum wells

that have a well depth of at least 40 meV. The Applicant will not include the distinguishing material elements identified above in quotes for each application into that of another co-pending application. The titles for each case clearly set forth the distinctions between all four applications. These distinctions will be maintained throughout prosecution until issuance of patents by the Applicant.

All five co-pending applications were all filed on the very same date by Applicant. Furthermore, all five applications have been assigned to Examiner and are currently being prosecuted together. Therefore, it is highly unlikely that any of the co-pending application will exceed the twenty year term that would be provided from their filing date of December 20, 2001. No further term of patentability is available for patenting. The Applicant, however, will be happy to submit a terminal disclaimer under 37 CFR 1.321 to limit the term of the present application if it should issue as a patent after any of the other co-pending applications first issue, wherein the term would be set to match that of the first application that issues from the co-pending applications.

Applicant or his assignee cannot, and does not plan to, extend the term of protection available for its filings of the four associated applications being that each was filed on the same day and will expire twenty years from their filing under current U.S. Patent law. Applicants have provided adequate notice in all co-pending applications that other related patent applications or patents associated with the present invention exist.

Applicant believes that the double-patenting issue has been overcome given the different focus of his invention as provided in the independent claims as originally presented, and as now amended, when compared to the distinct claim scope for the co-pending applications. Furthermore, the common filing date and common ownership of the applications, notice about associated applications/patents and willingness to terminally disclaim patent terms for the co-pending applications show Applicant's appreciation for any concern that might exist regarding the close association of the co-pending applications, despite their clear distinctiveness

as provided within their associated claims. For these reasons, Applicant respectfully request withdrawal of the provisional double patenting rejection.

IV. Rejections under 35 U.S.C. § 102

Claims 1-28 and 45-59 stand with a final rejection under 35 U.S.C. § 102(a) as being anticipated by Jewell et al. (6,359,920). The rejection of claims 1-28 and 45-59 based on Jewell et al is respectfully traversed.

Applicant again respectfully points out to the Examiner before engaging in further discussion of the distinctions between his invention and the cited art that U.S. Patent 6,359,920 was issued on March 19, 2002, which defeats its use as a prior art reference as a basis for the current rejections; however, Applicant is and has become very familiar with the subject matter described by Jewell et al in the patent, as it is a divisional application of U.S. Patent Nos. 5,825,796 and 5,960,018, also issued to Jewell et al. Applicant acknowledges the general subject matter relied on by Examiner in citing the '920 to the extent it is provided in the '796 and '018 patents, which truly predate Applicant's filing of the present invention.

Jewell et al describes techniques and their effects on peak transition energy within VCSELs. The discussion for Figure 2a-2b specifically identifies a range within which peak transition energy can be changed, the range being from about 40 meV to 125 meV. In fact when referring to Figure 2b in the discussion of reducing transition energy, Jewell et al states that "a reduction of about 40 meV may be achieved by utilization of a superlattice structure . . ." Applicant emphasizes that the discussion in Jewell et al is not directed to establishing quantum well depths. Jewell et al, as most skilled, is focused on increasing energy within the active region of a semiconductor laser such as a VCSEL; however, Jewell neither teaches nor suggests that a quantum wells "*depth*" which is a virtual area defined by the range between the valance and conduction bands can be controlled or adjusted. Jewell et al does not teach

that control over settings for valance and conduction bands can be used to establish optimum quantum well depths beginning at 40 meV.

Applicant is referring to achieving optimum valance and conduction band offsets for providing quantum wells having depths of at least 40 meV. Applicant has determined how to establish and control offsets, and quantum well depths as a result, by using certain materials. This is now clearly set forth in Claims 1, 45 and 53 wherein unique materials are used to produce valance and conduction bands that can establish well depths of at least 40 meV. Discussions of how to achieve band offsets and establishing quantum well depths by Applicant is not interchangeable with general observations and discussions of band gap efficiencies. The difference should be well understood by those skilled in the art after reading Applicants description. When referring to Applicant's discussion of "band offset," one skilled in the art should be able to realize that it is now possible to achieve optimum confinement of carriers within quantum wells for his device where the quantum well(s) comprises well depth of at least 40 meV. Jewell et al does not address quantum well depths nor does Jewell offer methods for purposely controlling well depths as taught by Applicant. For the foregoing reasons, the rejection of claims 1-28 and 45-59 is respectfully traversed.

V. Conclusion

Applicant has amended claims herein for the purpose of providing clarity regarding Examiner's rejection under 35 USC §112. Applicant has responded to each and every objection and rejection of the Official Action and now believes that his application is in condition for allowance.

In view of the foregoing discussion, Applicant respectfully requests that his applicant be reconsidered and that a timely Notice of Allowance be issued.

Should there be any outstanding matters that need to be resolved in the present application, the Examiner is respectfully requested to contact the undersigned representative to conduct an interview before further written action in an effort to expedite prosecution in connection with the present application

Respectfully submitted,

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